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14. ABSTRACT

A prototype has been developed to handle positioned based photos, videos, voice and environmental data. This prototype forms the basis for the following solutions. Middletown can provide an advanced simulation solution to provide better training. It can be delivered in the shape of a scalable client/server solution consisting of hardware, software and interface connectors to other infrastructures such as mobile networks. The Army and other designated users will be able to interact with both the simulator and real people and connect to the system through the internet and mobile phone infrastructure.

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1. Introduction

Phase II of this project shifted the focus towards the design and development of 3D and display/presentation technology to ensure a more realistic mobile emergency simulation application is presented to users. A "game engine" was introduced to merge different display and simulation technologies into one seamless system and tested in a real life situation.

- Design and develop 3D and display/presentation technology that will ensure a more realistic simulation is presented to users.

- Evaluate how different display and simulation technologies work in real life situations.

2. Body

The need to plan and calculate the effects of major emergencies including terrorist's attacks has become critical in the US Army. To ensure optimal military readiness, there is an urgent need to realistically simulate these events. Development of a realistic interactive emergency simulation and response system will help to ensure that US Army management and emergency personnel are adequate trained and prepared to respond quickly and decisively to any act of terrorism.

The US Army and society in general is rapidly developing towards greater dependence on fragile technological and management systems vulnerable to natural disasters and terror assaults.

There is a need in the US Army to simulate crisis situations. These simulations can be used to calculate the effects of different actions and countermeasures. Most importantly, these simulations can be used to train US Army management and emergency personnel.

- The US Government (Department of Homeland Security) has prepared a set of master scenarios in the event of emergencies or hostile strikes on US soil. To ensure civil and military readiness, these and other scenarios are regularly simulated

- The quality and learning from these simulations can be enhanced. There are also critical and prioritized issues in actual emergency and crisis management, strategic as well as a tactical, to further narrow the gap between simulation and the real situation

- Valuable information on Homeland Security needs to be simply and efficiently communicated between the 260 million American mobile subscribers and the relevant authorities

Mobile Media Inventions AS has developed a set of technologies that when merged together can produce the framework for this type of simulation system. These technologies have evolved from medical and entertainment 3D animation, mobile telecom interactive technology and satellite and aerial photography. When merged, developed, backed up by sufficient

statistical data and installed in a main frame computer system, a structural and sociological model can be generated.

The project has found a solution for a set of issues related to geographical database technology, automatic interpretation of high-resolution satellite images and stereo models and representation and rendering on different devices.

The concept comprises extensive use of high-resolution optical imagery. Generation of stereo models consists of determining the acquisition geometry of images that will be needed to retrieve the 3D positions of details of the ground surface and its objects. In order to generate the stereo model, a model is needed for image acquisition geometry and we need to determine the parameters of the model. These are determined by means of corresponding tie points between the images and ground control points, which refer to a global co-ordinate system.

The introduction of Java and picture phones to the marketplace has opened totally new possibilities within this field. Utilizing these technologies makes it possible to integrate mobile devices/users by collecting pictures from the user and sending pictures/maps and other information to them. It is also possible to distribute applications to be used for a particular event, in real-time.

These applications has been tailored to guide the user in an emergency situation and/or retrieve fundamental multimedia information from the scene and relayed back to the emergency center. This could be a medical person who is not at his desk or in the simulation center. He will take part in the simulation by using his mobile phone by receiving information (pictures, text, video) for the simulator and be able to play a scenario at any given time (without notice) and involve the resources needed to solve the specific situation.

In the situation, the phone will be used by real people involved in the simulation to report status (text/pictures/video) back to the simulator. These data is integrated in which the objects in the simulation model. It can also be used to track movements of real objects in a real situation. In this case, the Middletown20010 simulator is more a information system. In this manner, real situation data can be transferred and merged into the 3D simulation model and visualized.

From a US Army stand point, defensive rescue scenarios and situations could be simulated parallel to offensive interventions and operations. The simulator will also allow for very specific urban warfare scenarios. These simulations would create possibilities to test different tactical options in a given situation from an offensive, as well as, defensive point of view. Realism is a key word in connection with the concept.

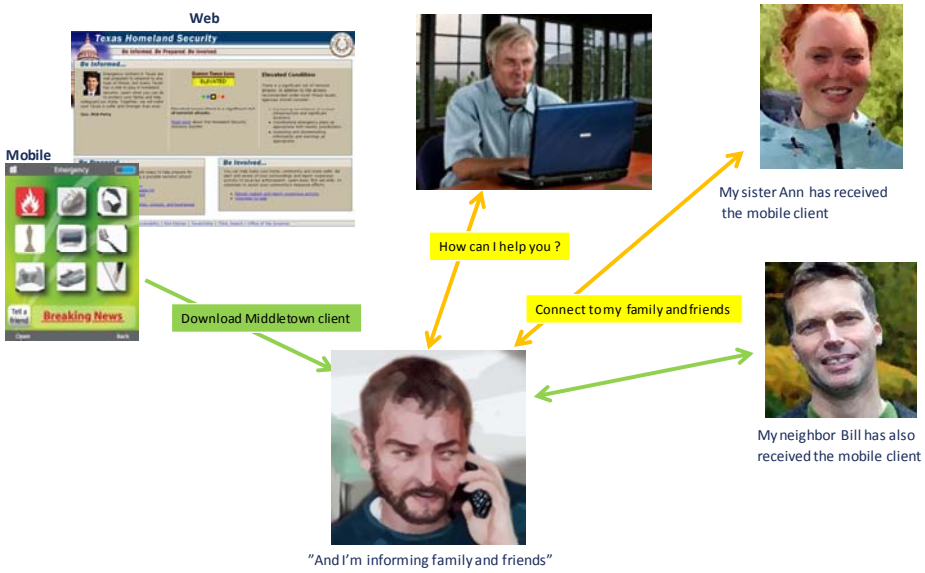
Mobile device technology

Mobile devices have been dramatically more powerful the last years and equipped with advanced functionality like GPS, camera and video. Today’s mobile devices are more powerful than PC’s were some years ago and the graphic quality will increase even more in the next years with the introduction of new graphic processors. Demos developed in Phase II have shown the important role that mobile devices have as both display and information gathering units in the future. However, as the size of the devices will stay the same due to usability reasons, it is important to design applications with very good user interfaces and simple, but advanced functionality.

In advanced simulation and response applications, such as the Middletown system, multiple viewers are using different, personal mobile devices to drill into the same information.

Emergencies and Crisis situations can be reduced in severity or avoided all together with better information systems. For example, when Katrina hit the USA, the simple fact that it was difficult to locate family and friends made rescue work much more difficult on many levels, in addition to being costly in terms of human life as well as expensive. We have created a system that in an intelligent way can use a person's cell phone as a critical device to receive and give critical information. The solution is suitable for both Government Agency and private use.

Figure 1. The Middletown client network and user interface



The Middletown Client is an application to be installed on users' mobile devices. It communicates via internet to the Middletown Server. The Middletown Client will integrate with third-party content providers within the area of Homeland Security and Emergency Services. The Middletown Client contains the telephone numbers and addresses of the Fire Department, Police, Ambulance, Middletown Control Center and other important Emergency Services. The user will be able to immediately contact these Emergency units via the simple push of a button.

The solution comprises extensive use of high-resolution optical imagery. The generation of stereo models consists of determining the acquisition geometry of images that will be needed to retrieve the 3D positions of details of the ground surface and its objects. In order to generate the stereo model, a model is needed for image acquisition geometry and we need to determine the parameters of it. These are determined by means of corresponding tie points between the images and ground control points, which refer to a global co-ordinate system.

The Middletown can provide an advanced simulation solution to achieve a better training ground. It will be delivered in the shape of a scalable client/server solution consisting of

hardware, software and interface connectors to other infrastructures, such as mobile networks. The main product is a server-client. A Java client will be talking with this client from a mobile device. The service will provide position based in real time. Thus both time and place will be used to target specific information relevant for the particular users. Then information will come from the web and typically be related to security. An individual on the move in any terrain will be offered different security and crisis- related information that meets his or her needs as time, and their position change. Ease of use and efficiency of information delivery combine to make this a highly advanced application in which time and position are critical factors.

Figure 2. Middletown mobile user interface

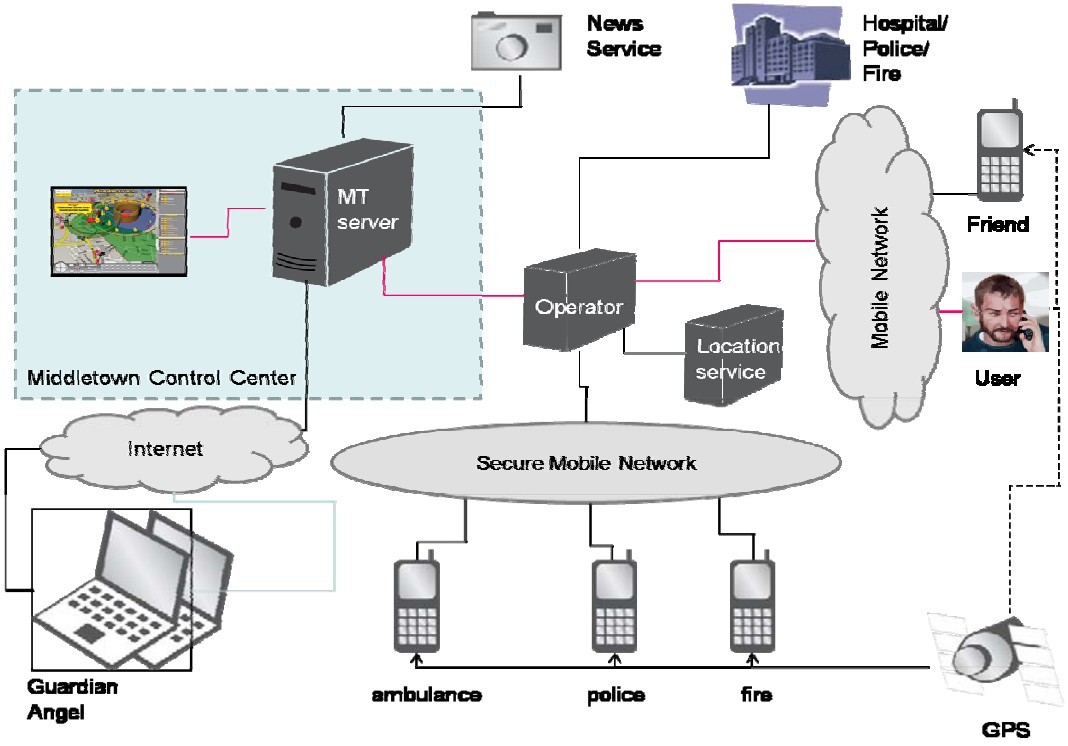
The mobile user can access several levels of information. The First menu level can give easy access to functions such as:

1. Medical emergencies
2. Traffic situations and status
3. Explosions
4. Weather
5. Biochemical information

In the case of a biochemical emergency, the Second layer can give biomedical information listing different compounds considered dangerous. The Third level will show a situation

or location of interest. Note that all this information will change according to accreditation of information, interest, position and time. The interactivity of dynamic information gives a unique solution system.

Figure 3. The Middletown Technical infrastructure solution



Specifications

1. Instructions

Broadcasting of vital information on how to behave in a crisis situation.

2. Guardian Angel

Putting the user in touch with a contact person or "Guardian Angel", who can give medical or other assistance remotely.

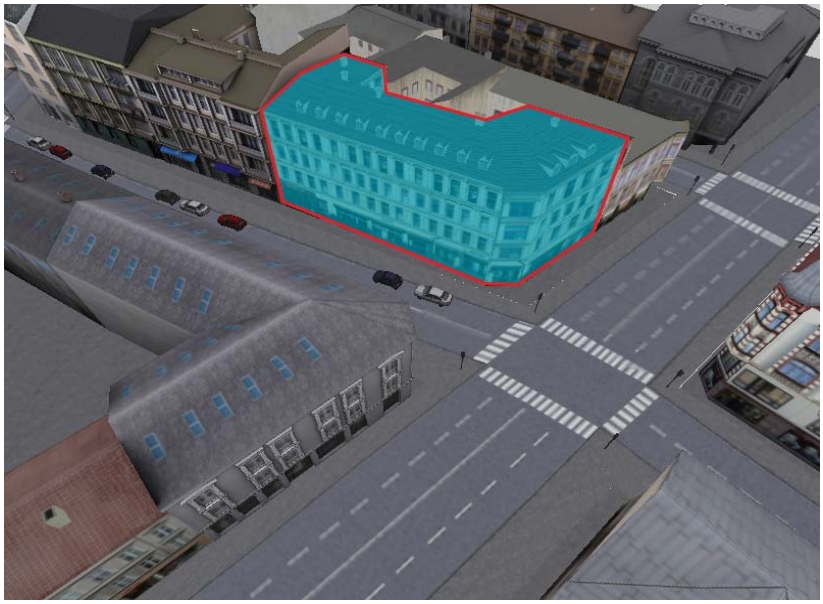
3. Family, Neighbors & Friends

Communication between the user and the control center enable both to receive and deliver quick and reliable information to family members, neighbors or friends.

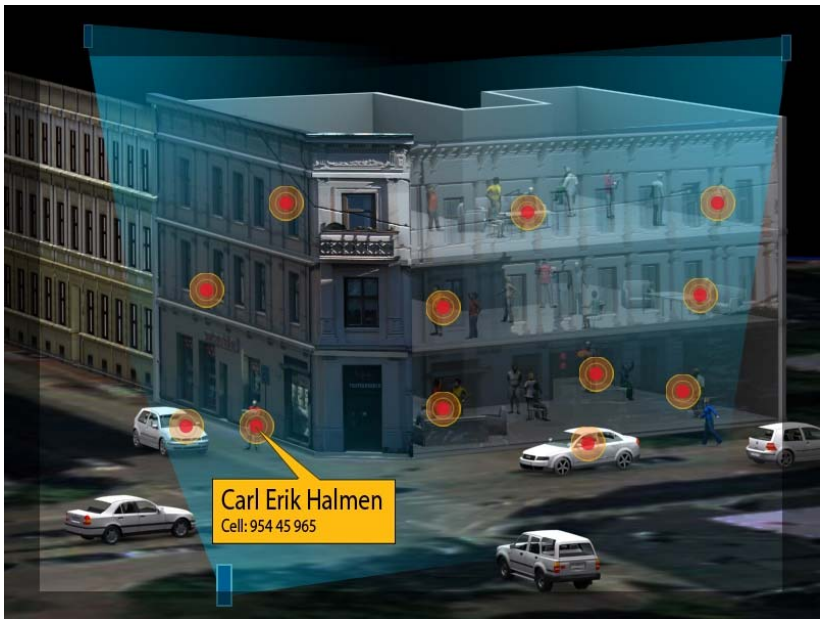
3. Localization

Positioning so that relevant information can be exchanged between the mobile user and Middletown.

Figure 4. Middletown interface with Google Earth



Google Earth has earned tremendous interest, however this is as far as it goes….



This illustrates the Middletown concept: we can track mobile users in a building and in a 3D model. Also, the mobile cell phone owners can communicate to the central with real time voice, sms, video and pictures. Coupled with accessing floor plans, 3D models of buildings from third party providers within minutes a broad set of critical scenarios can be better dealt with.

3. Key Research Accomplishments

A prototype has been developed to handle positioned based photos, videos, voice and environmental data. This prototype forms the basis for the following solutions:

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- Middletown can provide an advanced simulation solution to provide better training. It can be delivered in the shape of a scalable client/server solution consisting of hardware, software and interface connectors to other infrastructures, such as mobile networks.

- The Army and other designated users will be able to interact with both the simulator and real people connecting to the system through internet and mobile phone infrastructure.

- In crises, the simulator can transform from a training tool to an information and "what-if" planning system. The simulated objects will then be replaced by real objects which are controlled by real events.

- Information regarding these events is fed into the system from various sources such as mobile phones (positioning, pictures, text, videos) and input through the systems graphical user interface.

4. Reportable Outcomes

Publications: None

Preparation for an application to create a fully operational version based on research findings in Phase I and II is in progress. Additional funding is being explored both in the US and in Norway.

5. Conclusion

Middletown 2010 project has progressed further in Phase II to achieve the goal of building the defined simulator. These are:

- Automatic generation of urban scenery models from satellite images and mobile photos

- User interfaces to tackle fast and reliable position based interaction with mobile devices

In Phase II we have worked on how to create high quality models of urban places (houses, buildings, etc.) based on air- and satellite photos. More work is need here to allow a semi-automatic 3D display on a mobile phone based on a series of 2D photographs taken either by public at large or emergency personnel.

Before a fully operational version of Middletown 2010 is ready, there is a need to address the integration issue with other technical platforms more in depth. This has been addressed from

the start but the development towards more open and standard solutions for data and service interaction suggests resources can be saved by integrating Middletown with existing solutions. Our plan continues to build upon what is already invested in other projects.

The issue of user interface (how the user interacts with the Middletown system) has been addressed in more detail during phase II. We have developed a mobile application and worked to find solutions that support the research of building urban 3D models faster and with higher quality. The result of Phase II indicates that it is possible to take images from Google earth and similar publicly known sources and integrate individual positions based photographs from the public or emergency personnel to capture effectively what is going on the ground. Together, these two image sources can form the basis for a fully operational Middletown client-server application.

6. References

None

7. Appendices

None